

Appl. No. 09/674,648
Amdt. dated , 2006
Reply to Office action of October 12, 2006

Amendments to the Claims:

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): A method for the manufacture of a cam shaft from a tube, the cam shaft having bearer rings attached thereto, the method comprising the following steps:

placing bearer rings in correspondence with prospective locations of hollow cams on said cam shaft, each of the bearer rings having an outer surface and an inner surface, the radial thickness between the outer and inner surfaces being equal completely around the tube, and the necessary hardness, strength and wear resistance, and being formed in a separate method;

upsetting regions that lie at the ends of the tube outside the regions in which the cams are seated so as to be increased in thickness for forming different functional elements;

placing the tube and the bearer rings in a high internal pressure forming tool;

applying axial forces to the ends of the tube; and

applying a medium under a high internal pressure to the tube, whereby the tube is expanded in defined regions to form the hollow cams from the material of the tube and whereby the bearer rings are attached to the hollow tube cams in a frictional and interlocking manner by expansion of the tube.

Claim 2 (canceled): The method as set forth in claim 1, characterized in that in a step prior to such high internal pressure forming, regions that lie at the ends of the tube outside the regions in which the cams are seated, are upset that same are increased in thickness for forming different functional elements.

Claim 3 (previously presented): The method as set forth in claim 1, characterized in that between the cam shaft ends in a step prior to internal high

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pressure forming bearing faces and the eventual region where the cams are to be seated, are produced by round kneading and by reducing the diameter in this part to the desired size.

Claim 4 (previously presented): The method as set forth in claim 1 or in claim 2, characterized in that between the cams bearing faces are produced by internal high pressure forming by expanding the tube.

Claim 5 (previously presented): The method as set forth in claim 1, characterized in that the bearer rings are hardened in a known manner prior to being placed in the internal high pressure forming tool.

Claim 6 and 7 (canceled)

Claim 8 (canceled): A cam shaft, characterized in that the cam shaft is produced from a tube (1) by the internal high pressure forming method set forth in claim 1, the shaft comprising regions of the tube defining hollow cams (2) in form and in position in a single piece, and on the formed cams (2) bearer rings (3) shaped to correspond to the cam periphery and made of a hard, wear-resistant material is secured frictionally and in an interlocking manner, each of the bearer rings having an outer surface and an inner surface, the radial thickness between the outer and inner surfaces being equal completely around the cam.

Claims 9 and 10 (canceled)

Claim 11 (canceled): A cam shaft as set forth in claim 8, characterized in that the bearer rings (3) consist of sintered metal, or plastic or ceramic material.

Claim 12 (canceled): A cam shaft as set forth in claim 8, characterized in that the tube (3) consists of aluminum, magnesium, or titanium or alloys thereof.

Claim 13 (canceled)

Claim 14 (canceled): A cam shaft as set forth in claim 8, characterized by additional drive and control elements secured by the internal high pressure forming method.

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Claim 15 (canceled): A cam shaft as set forth in claim 14, characterized in that at least one radially extending groove (4) is produced in the bearer ring (3) and the drive and control elements.

Claim 16 (canceled): A cam shaft as set forth in claim 14, characterized in that the side, facing the tube (1) of the bearer ring (3) has chamfers on one or both sides on the side facing the tube

Claim 17 (canceled): A cam shaft as set forth in claim 8, characterized in that the bearer rings (3) are hardened prior to application on the formed cams.

Claim 18 (canceled): a cam, shaft as set forth in claim 14 characterized in that the additional drive shaft and control elements are sprocket or gear wheels.